motion appeared to be from northwest to southeast, and a rumbling noise was reported to have been heard during the shocks. Earthquake shocks were felt in Lake City, Fla., at the same time.

1886, August 31. Earthquake shocks were felt in this city from 8:52 p. m. to 9:03 p. m. The first vibrations were light, but were continuous for a minute and a half, when three or four severe shocks occurred in quick succession, the most violent of which was at 8:53:30 p. m. This building (the Astor Building) vibrated with the shocks and seemed to move from east to west, as the swaying of a railroad train along a straight track, with now and then a sudden lurch, as if the train had turned a sharp curve. The windows, doors, and furniture rattled, and it was difficult for one to stand without support. Distinct earthquake shocks were felt in the city on September 1, at 3:30 a. m. and 3 p. m.; on the 3d, at 10:03 p. m.; 5th, at 10:15 and 10:18 p. m.; 8th, at 12:34 p. m.; 9th, at 12:47 p. m., and on October 22, a shock was felt thruout the city at 4:24 a. m., lasting fifteen seconds, and with energy sufficient to rattle dishes, windows, etc.

The great earthquake shock began in the city of Charleston within a few seconds of 8:51 p. m., ninetieth meridian time, on August 31, 1886.

1893, June 20. An earthquake shock was felt at 10:07 p. m. The duration was about ten seconds and the motion vibratory and continuous, direction northeast to southwest, intensity moderate.

THE UTILIZATION OF MIST, FOG, DEW, AND CLOUD.

In the MONTHLY WEATHER REVIEW, October, 1898, and March, 1899,[1] we suggested methods by which the fog and cloud particles driven by the wind over a region where but little rain falls could be caught and led to the roots of plants and thus made as effective as rain in promoting the growth of useful vegetation. If the large quantity of water that drips from leaves in foggy weather could be quickly conducted to the soil and conserved at a depth of a few inches, it would largely replace the defect of rainfall in a droughty season.

It would seem that the formation of dew also may be intensified and accelerated, so that dew, properly so called, can be led directly to the absorbing rootlets of plants. A dew-pond, however, need not rely wholly upon dew; it may be so constructed that dew, fog-drip, and rain shall all be utilized to maintain the pond. The experiments that have been successful in the moist climate of Great Britain, as explained in the following article by E. A. Martin, are surely worth trying in many portions of the United States.—*C. A.*

DEW-PONDS.

By EDWARD A. MARTIN, F. G. S.

[Reprinted from Knowledge and Scientific News, May and June, 1907, omitting the illustrations.]

The literature devoted to the subject of dew-ponds is of a very scanty nature, whilst those writers who have dealt with the subject differ considerably amongst themselves as to the principles, if any, on which such ponds are formed, and also, indeed, as to whether the ponds have any right to be called "dew-ponds" at all.

In considering the subject, it is, of course, primarily necessary to recognize clearly how dew is formed, but even in what appears to be such an elementary matter as this there is not a unanimity of opinion. Many meteorologists still maintain the old theory, which is certainly the popular theory, that dew is formed by the precipitation of the aqueous vapour already existing in the lower layers of the atmosphere, when the radiation of heat from the earth has caused its surface to be in the condition to chill below the dew-point the layer of saturated air in contact with it. Precipitated moisture may appear in the form of dew, hoar-frost, mist, fog, or cloud, but in dew and hoar-frost there is precipitation without a cloudy intermediary. Freest radiation of heat from the earth's surface takes place when there are no clouds to reflect to earth the heat which it gives off at night. If there are no clouds, the chilling of the ground and of the layer of air in contact with it will be considerable, and the temperature may be reduced to the dew-point.

During the last twenty years the acceptance of Dr. J. Aitken's theory has been rapidly growing, that dew is really formed from the moisture which rises out of the soil with the radiation of heat, and that it is this which is precipitated when the air into which it passes has been so reduced in temperature as to be unable to hold it as aqueous vapour. If this theory be the correct one it would at once dispose of the suggestion altogether that dew-ponds are fed and filled by true dew, since the acquisition of dew could only then be obtained at the expense of itself by earlier evaporation.

Messrs. Hubbard, in their "Neolithic Dew-Ponds and Cattleways," give some details as to the formation of these ponds, although the source of their information is not stated. They say that there is at least one wandering gang of men, who will construct for the modern farmer a dew-pond which will contain more water in the heat of summer than during the winter rains. The space hollowed out for the purpose is first thickly covered with a coating of dry straw. The straw is in turn covered by well-chosen, finely-puddled clay, and the upper surface of the clay is then closely strewn with stones. The margin of the straw has to be effectually protected by the clay, since if it becomes wet it will cease to attract the dew, as it ceases to act as a nonconductor of heat and "becomes of the same temperature as the surrounding earth." This would, of course, follow quickly if a runnel or spring were allowed to drain into the pond. The puddled clay is chilled by the process of evaporation, and the dry straw prevents the heat of the earth after a hot day from warming the clay.

It is very certain, however, that many alleged dew-ponds are not formed on this plan. This description, it will be observed, clearly presupposes that dew is formed out of the aqueous vapour already existing in the atmosphere, so that if Doctor Aitken's theory is correct, it would seem that a new name is needed to describe water that is precipitated out of the atmosphere in such a case, without the intermediate condition of mist or cloud. Such might be called "invisible mist." Some remarks by G. G. Desmond in the "Nature Notes Column" of the Daily News gave a different arrangement for the basis of the dew-pond. It was there stated that first a bed of concrete is laid down; this is covered with straw, over which is placed another layer of concrete. I have been unable to trace the authority on which this is based.

In a private letter from the maker of some ponds on the "Duke of Norfolk Downs" and on Amberley Mount, it is stated that the highest parts are chosen, as they are "more exposed to the weather" than lower down, the inference being that they are filled by the moisture-laden winds blowing in from the southwest, no consideration being given whatever to any artificial attempt to attract dew-precipitation. But as R. H. Scott says, dew can never appear when there is much wind, for the air can not remain long enough in contact with the soil for any material reduction of its temperature and consequent condensation of moisture to take place. (Int. Sci. Series, Vol. XLVI). The "weather" referred to can only, therefore, be mist or fog.

In 1877 Mr. H. P. Slade discarded the term "dew-ponds" in favour of "artificial rain-ponds," and scouted the idea that dew had any part in filling ponds at all. His remarks dealt practically with one pond, the greatest diameter of which was 69½ feet, which was constructed in 1836 at a cost of £40. It was

[1] Vol. xxvi, p. 466; Vol. xxvii, p. 113.

bedded in the Thorpe Downs, near Loughborough, on the Berkshire Hills, at a height of 450 feet above the level of the sea. Being "fed from the heavens," this fact probably gave rise to its being classed as a dew-pond. The basis of this pond was stated to be first, a layer of clay about 12 inches thick (mixed with lime to prevent the working of earth-worms), second, a coating of straw, "to prevent the sun cracking the clay," and, thirdly, a layer of loose rubble. During an interval of 40 years, till 1876, the pond had only once been dry. The exception was in 1854, and this resulted principally from the growth of rushes, whose roots struck through the clay bottom, causing leakage in what was otherwise "a waterproof bed." The straw was not held to have any particular effect in causing dew-precipitation, and the rubble, which would, of course, by the way, allow of the straw becoming saturated, was merely to prevent the hoofs of cattle trampling upon and perforating the clay, or puddle, as it is called.

Gilbert White's mention of the little ponds on the downs around Selborne is an early reference to this class of ponds, but he does not actually call them "dew-ponds," so that the name may have come into use subsequently to his time. He says: "Now we have many such little round ponds in this district; and one in particular on our sheep-down, 300 feet above my house, which, though never above three feet deep in the middle, and not more than 30 feet in diameter, and containing, perhaps, not more than two or three hundred hogsheads of water, yet never is known to fail, though it affords drink for 300 or 400 sheep, and for at least 20 head of large cattle beside. This pond, it is true, is overhung with two moderate beeches, that, doubtless, at times afford it much supply; but then we have others as small that, without the aid of trees, and in spite of evaporation from sun and wind, and perpetual consumption by cattle, yet constantly maintain a moderate share of water, without overflowing in the wettest seasons, as they would do if supplied by springs. By my journal of May, 1775, it appears that 'the small and even considerable ponds in the vales are now dried up, while the small ponds on the very tops of the hills are but little effected.' Can this difference be accounted for from evaporation alone, which certainly is more prevalent in bottoms? or, rather, have not these elevated pools some unnoticed recruits, which in the night time counterbalance the waste of the day; without which the cattle alone must soon exhaust them?"

White then quotes Doctor Hales as remarking "that more than a double quantity of dew falls on a surface of water than there does on an equal surface of moist earth," but one must remark that this does not necessarily always hold good.

J. C. Clutterbuck, in 1865, said that in making such ponds an excavation was made in the chalk on the tops of the hills, from 30 to 40 feet or more in diameter, and from four to six feet deep. The bottom was "covered with clay carefully tempered, mixed with a considerable quantity of lime. * * *" This was "protected from the action of the sun and atmosphere by a covering of straw." After this "efficient and impermeable coating or puddle" is completed, "a layer of broken chalk is placed upon it."

It will have been noticed that in the Hubbard statement the excavated hollow is, in the *first* place, covered by straw, after which puddled clay is deposited thereon, with a strewing of staves on the top of that.

I should like to trace the wandering gang of men referred to in their work. I hoped to have hit upon some of them in the summer of 1906, when I found that a pond-maker, who seemed to be well-known, was said to be at Alfriston. I interviewed him on the subject, but only found that the ponds which he made, whether on high or low ground, consisted of an excavated hollow, with a carefully concreted bottom. With thermodynamics he had nothing to do, nor did he show any inclination to advance the cause of science by building a scientific dew-pond. For £30 or £40 he would build one anywhere, but he would choose a site where runnels made their appearance in rainy weather.

In Johnson and Wright's "Neolithic Man in Northeast Surrey," reference is made to the fact that some old Surrey people do not use the term "dew-ponds" at all for these remarkably constant supplies of water which are found on the chalk hills, but call them "mist-ponds," and the more inquiry is made into the origin of them, the more difficult it is to think of the majority of them as *dew*-ponds in the full sense of the word.

It has been attempted with some success to attribute the first formation of dew-ponds to the Neolithic peoples in England, and this has been the view of various writers on the subject, the necessity very early showing itself to such people of having reliable water supplies when besieged or shut up, even though for a short time, in their hill-camps. But, as Pitt-Rivers has pointed out, the time during which such sieges lasted could not have exceeded a day or two at most, and I can not help thinking that the ponds are more likely to have been constructed principally, if not entirely, for the watering of cattle, this being just as much a necessity in times of peace as in times of strife. The herbage found on the downs was then, there is no reason to doubt, just as sweet and wholesome as it is now, and our flocks are, by preference, still found in immense numbers on the Surrey and Sussex hills, although there are no marauding bands to waylay them nowadays in the lower lands near by.

It should be noted that Pitt-Rivers, in his notes on the Winklebury Camp excavations, 850 feet above sea-level, speaks favourably of the idea that these highly-placed camps may have been watered by springs which then ran at a higher level than now. And, of course, if there were a probability of this, we should have here important evidence in favour of some dew-ponds having been filled at one time by springs. But this could never have been so in the case of those ponds which are really at the very summit of the downs. Gilbert White referred to the fact that the water-line in chalk was always found at the same level in all the wells in his district, although recent observations in Yorkshire go to show that the water-line follows the contour of the chalk hills. We know that since so many private wells and borings have tapped the chalk under London, the water level has been steadily sinking. The chalk is sometimes likened to a sponge in the way in which it soaks up water, and if this be the case, it will not yield surplus water until it has itself been saturated. But then, if the water-level be lowered, as we know it has been lowered, the chalk would still remain saturated if we grant it this soaking power, although above that water-level it would not yield a supply which could be tapped by well-sinkers. In the olden days, therefore, it would not have been any more likely to have given rise to springs than now, and little more than the mere surface drainage, or that part which remained after percolation, would have gone to fill the ponds. Pitt-Rivers also points out that in many chalk districts "there are high springs which run only in the winter, when the hills have sopped up the winter rains, and retained them like sponges at the higher levels." ("Excavations in Cranborne Chase," Vol. II., p. 237.) But this can have no reference to summit-ponds, although the statement is quite true, and was probably considerably more so in former times, when forests and woods existed which have since been cleared. Still, if these springs merely flow because the water which supplies them can not sink into saturated chalk, then the ponds which they feed have no special reason to be called "dew-ponds" at all.

Yet, as White informs us, these strange little ponds on the tops of the hills are full when those in the bottoms are dried up; that is, in times when there has been a dearth of rainfall, and this, although it is admitted that the water-level in the

chalk has sunk as compared with earlier times. And, as Johnson and Wright say, even in our times the strange spectacle is sometimes seen "of carts being sent up hill to procure water for the granges and bartons in the vale." Besides, Mr. J. C. Clutterbuck refers to the fact, evidently admitted so recently as 1865, that the tops of chalk hills are often chosen for sites, where no surface-water except rainfall can furnish a supply. Therefore, as White says, there must be "some unnoticed recruits, which in the night-time counterbalance the waste of the day."

What are these recruits? As the ponds have come somehow to be known as "dew"-ponds, it will be well first of all to consider whether dew is one of these recruits. H. V. Slade dismisses at once the possibility of it acting as such. It must be borne in mind, however, that he particularly referred to the one pond only, and in that the straw was laid on the clay or puddle, and the only object of the straw was, according to his statement, with a view "to prevent the sun cracking the clay." He did not suggest that the straw was of use in keeping the water of the pond cool. But Hubbard says that the purpose of putting the straw *under* the puddled clay is to prevent the clay receiving heat from the earth which the latter has absorbed during the warmth of a summer day. At the same time the puddled clay is chilled by the process of evaporation, and the straw acting as a nonconductor, the moisture contained in the warmer air is deposited in the form of dew. In this way an empty pond will become filled without other assistance, the condensation during the night being in excess of the evaporation during the day, until, presumably, the margin of puddled clay around the pond becomes smaller and smaller, and dew deposited thereon ceases to recruit the pond.

In the meantime, as pointed out by Professor Miall, although water itself is a bad conductor of heat, the surface of a pond would cool by radiation (very slowly), and in cooling would, of course, become denser. The layer at the surface would, therefore, sink, and give place, by convection currents, to water not yet cooled to the same extent and, therefore, less dense. The process of replacement being continued, the net result may be that the whole mass is cooled sufficiently to chill the superincumbent air below the dew-point. In this way a dew-pond, if built on the Hubbard plan, and granting the principles advanced by them, would, after becoming filled without artificial assistance, continue to receive dew (invisible mist, as I have called it), when partially filled, although the greater part of the clay were covered.

Clutterbuck, on the other hand, says that the water must, in the first place, be introduced by artificial means, but in this case we must remember that the straw was placed over the clay, and it was not claimed that the straw in any way attracted the deposition of dew. As Miall says, this seems to be decisive against the sufficiency of rainfall alone, in so far as such ponds are built after Clutterbuck's plan.

Clement Reid states that "the open downs, even in the middle of summer, receive much heavier dews than would be expected, or than are met with on the lowlands." But he adds that "thick sea-mists often cling to their top [of the open downs] for several hours after sunrise, while the plains below are already dry and sunny." This brings us to the question of mist acting as a recruiting agent, and one can not help thinking that this may be of material benefit to the pond.

The claim that dew alone is the great cause of the permanence of such ponds receives a shock from an experiment conducted by J. G. Cornish at Lockinge, in Berkshire, and recorded in C. J. Cornish's "Naturalist on the Thames." The temperature of the water in a dew-pond on Lockinge Downs on July 16, 1901, was 20° F. higher than the temperature of the air. Dew, could not, therefore, have been deposited, since the temperature would probably have been maintained throughout the night, but if not, the difference in temperature of the water and of the air would, at any rate, have been accentuated. This would be in accordance with the principle that water, although it takes longer to warm, yet when once it acquires a certain temperature it retains its heat without materially warming the air above it. Water has far less absorbing and radiating power than dry land, and, therefore, would have less effect on the air above it. Mr. R. H. Scott states that "as the specific heat of water is five times that of dry land, it takes five times as much heat to raise a given mass of water through a given range of temperature as it does to raise an equal mass of dry land."

Mr. Cornish also records that, on the other hand, five days of heavy dew in April and May, with no fog, raised the level of the same pond no less than 3½ inches. This record is so extraordinary that one hesitates to give it credence, and further similar observations are desirable. Attempts have been made from time to time to measure dew-fall, and Mr. G. Dines, in a paper "On Dew, Mist, and Fog," gave the average of his observation at 1.397 inches, or on the grass alone at 1.022 inches. "Making a liberal allowance for contingencies, it may, I think, be fairly assumed the average *annual* deposit of dew on the surface of the earth falls short of 1.5 inches." What, then, are we to say to a reported deposit of 3½ inches in five days?

One can scarcely help admitting that the positions of the ponds which are known favour the fact that fogs do add a certain quantity of water to them. The experiments of Mr. Cornish, or, rather, of the shepherd whom he engaged, are very striking. After a night of fog, the surface of his pond was found on January 18 to have risen 1½ inches; the next day, following another fog, gave 2 inches; and on January 24 an inch was measured. It was not recorded what was the principle on which the bottom of the pond was laid.

If mist be measured as a valuable agent in recruiting the ponds, then it is a fit subject for enquiry as to what steps should be taken to encourage the deposition of the mist as water. White admitted that an overhanging beech or other tree was of importance in connection with some of the ponds around Selborne. Clement Reid thinks that an overhanging tree on the side nearest the source of the moisture laden currents of air is of importance. "When a sea-mist drifts in," in early morning or towards evening, "there is a continuous drip from the smooth leaves of the overhanging tree."

The position of the pond now becomes of importance, and if the pond has a high southern or southwestern bank, it seems to act in a favourable way in causing fog to precipitate its moisture.

The Sussex Downs are the home of the dew-pond, and many a time for the whole of a day I have walked through dense fogs which have rolled in from the sea, and have finally taken their flight, as from a jumping-off ground, along the northern ridge of the downs between the Dyke and Plumpton. The trees, where there are any, such as the Holt, near Clayton, will then be seen and heard dropping water on to the leaf-soil below, whilst one's own garments become damp and clammy.

One does not like to part from the idea that dew-ponds have been correctly so named, but there is no direct proof that they are so. On the other hand, there is a good deal to throw doubt upon its correctness, since no pond, situated as they are, could fail to receive a great deal of condensation from mists.

But I am strongly inclined to think that the use of straw may have a good deal to do with the attraction of moisture to a pond. It is used in India to produce a low temperature and so obtain ice in the open, at night time. Mr. T. A. Wise has described (*Nature*, Vol. V., p. 189), a method by which quantities of ice are obtained in the neighbourhood of Calcutta. An excavation of the ground to the depth of two feet is made. This is filled with rice straw to within six inches of the surface, somewhat loosely laid. Shallow pans of porous earthenware are then filled with water, and as long as the air is comparatively still the ice forms in the pans. The straw is a powerful

radiator, and, being kept loose and dry, prevents the heat rising from the earth to the water in the pans. Heat is cut off both top and bottom, and it is stated that the temperature of the air in contact with the dishes is reduced some 20° below that two or three feet higher up. This practice certainly seems to throw some light on the use of straw at home.

One thing, at any rate, is certain, that mists contribute largely to these ponds. What we need now is a scientifically-constructed pond on the Hubbard principle as a first experiment. At present I know of no other direct and unqualified statement as to what a dew-pond really is, how it is constructed, and why it attracts the dew, and it might, I think, be put to the test. Then if it were successful in collecting water, with no artificial introduction of a supply in the first place, meteorological observations might follow to show, if possible, the laws which were most potent in accomplishing it.

NOTES FROM THE WEATHER BUREAU LIBRARY.

By C. FITZHUGH TALMAN, Assistant Librarian.

HIGHEST ASCENT OF A SOUNDING BALLOON.

In Ciel et Terre of January 1, 1908, M. Vincent describes the ascent of a sounding balloon at Uccle, Belgium, on July 25, 1907, to an altitude of 26,557 meters (87,131 feet, or about 16½ miles), the greatest altitude known to have been attained by a balloon. The meteorograph worked perfectly, and the flight of the balloon was followed with a theodolite until it had descended to an altitude of 5,000 meters. The "inversion layer," "warm layer," or "isothermal zone"—as it is variously called in the recent literature of aerial exploration—was encountered at an altitude of 12,112 meters, at which point a temperature of —57° C. was recorded. From this point upward to an altitude of 13,591 meters the temperature rose 6.7° C. As the balloon continued to ascend the recorded temperature remained about stationary for some time, then began to rise slowly, and at the highest point of the ascent a temperature of —42.2° C. was recorded. The temperatures recorded during the descent of the apparatus agreed very closely with those recorded during the ascent at corresponding altitudes, despite the fact that the balloon fell much more slowly than it rose, and the air in the latter case, passing upward thru the apparatus, did not come in contact with any part of the mechanism exposed directly to the solar rays before reaching the thermograph.

A most interesting feature of the ascent was the generally westward drift of the balloon after reaching an altitude of about 19,500 meters up to the highest point attained. A zone of easterly wind at least 7 kilometers in thickness was thus shown to exist above the region of westerly wind.

THE "GOUFFRE" IN HAITI.

The October, 1907, number of the meteorological bulletin published by Professor Scherer, of the College St Martial, Port au Prince, Haiti, contains a note on the subject of the "gouffre," which is defined as "a noise resembling the rolling of thunder or the firing of distant cannon," and is said to have been frequently observed in Haiti, especially at the time of the eruption of Krakatoa. The word "gouffre," in this sense, does not appear in the dictionaries of Larousse and Littré, and is evidently one of the many expressions peculiar to the French West Indies. The phenomenon referred to, however, is a familiar one in many parts of the world, and is known under a great variety of names. In Italy it is variously called "bomba," "rombo," "boato," "bonnito," "bombito," "bombonamento," "borbottio," "muggito," "mugghio," "urlo," "baturlio," "trabusso," "tronazza," "tuono," "tromba," "rufa," etc., and the latest Italian investigator of the subject, Prof. Tito Alippi, has invented a new name, "brontidi," borrowed from the Greek, and meaning "like thunder."[1] In Holland and Belgium the name "mistpoeffer" prevails, while English writers have generally preferred the term "barisal guns," from the name of a town (Barisal, pronounced *barisahl'*) in the Ganges delta. The German term is "Nebelzerteiler" or "Nebelknall."

The cause or causes of this phenomenon are still obscure, but the elaborate investigations now in progress in Italy, under the direction of the Central Meteorological Office at Rome, will perhaps shed some light on the subject.

[1] Ciel et Terre, 1 juillet, 1907, p. 212.

PHENOLOGY IN THE BRITISH ISLES.

Phenological observations in the British Isles have for many years been especially associated with the name of Edward Mawley, phenological recorder to the Royal Meteorological Society. Writing on "Phenology as an aid to horticulture," in the Journal of the Royal Horticultural Society for June, 1907, Mr. Mawley reviews his work in this field and presents some of the results obtained. By reducing the number of plants observed from fifty to thirteen he was able to secure a large corps of competent observers, distributed over each of the eleven districts into which the British Isles are divided both for phenological and weather-forecasting purposes.

As a result of fifteen years' observations, it is found that there is an average difference of twenty-two days between the flowering of the same plants in the south of Ireland, the earliest of the eleven districts, and the north of Scotland, the latest district. The variations in certain districts from year to year are shown in Table 1.

TABLE 1.—*Mean results, with their variations from fifteen years' average (1891–1905), for the thirteen plants in those districts where there have been sufficient observations to warrant comparisons being made.*

	England, SW.		England, S.		England, Mid.		England, E.		England, NW.	
Years.	Day of year.	Variation from average.	Day of year.	Variation from average.	Day of year.	Variation from average.	Day of year.	Variation from average.	Day of year.	Variation from average.
		Days.		*Days.*		*Days.*		*Days.*		*Days.*
1891..	144	+10	144	+ 9	150	+11	147	+10	150	+ 6
1892..	139	+ 5	138	+ 3	144	+ 5	153	+ 6	147	+ 3
1893..	118	—16	122	—13	125	—14	123	—14	128	—16
1894..	126	— 8	130	— 5	135	— 4	127	—10	137	— 7
1895..	139	+ 5	138	+ 3	141	+ 2	138	+ 1	144	0
1896..	125	— 9	128	— 7	132	— 7	130	— 7	134	—10
1897..	130	— 4	132	— 3	136	— 3	132	— 5	142	— 2
1898..	133	— 1	135	0	138	— 1	136	— 1	141	— 3
1899..	136	+ 2	136	+ 1	141	+ 2	138	+ 1	145	+ 1
1900..	142	+ 8	141	+ 6	144	+ 5	143	+ 6	152	+ 8
1901..	138	+ 4	139	+ 4	141	+ 2	139	+ 2	144	0
1902..	139	+ 5	140	+ 5	145	+ 6	142	+ 5	152	+ 8
1903..	134	0	134	— 1	137	— 2	134	— 3	145	+ 1
1904..	139	+ 5	139	+ 4	142	+ 3	140	+ 3	149	+ 5
1905..	133	— 1	135	0	138	— 1	136	— 1	144	0
Mean.	134	.....	135	.....	139	.....	137	.....	144	.....

TEMPERATURE OF THE UPPER AIR OVER LAPLAND.

In the Annuaire de la Société Météorologique de France, July, 1907, M. Teisserenc de Bort sums up the most important results of the observations with sounding balloons made by his assistant, M. Maurice, at Kiruna, Lapland, during the early spring of 1907. Observations were made on the same dates at the observatory of Trappes, near Paris. A comparison of the two series shows that the upper air in the vicinity of the Arctic Circle, even at the end of the winter, has a temperature differing but little from that observed at the same altitude and at the same season in middle latitudes. With regard to the vertical distribution of temperature the following facts have been established:

1. The zone in which the temperature ceases to fall (with ascent of the balloon), the so-called "isothermal zone," the existence of which was demonstrated as early as 1901 by observations at Trappes, occurs also at the Arctic Circle.

2. The curious phenomenon first observed by Assmann, viz, a slight *rise* of temperature (with ascent) within the isothermal zone, is also indicated in the observations at Kiruna.

3. In middle latitudes the altitude at which the isothermal zone begins varies by several thousand meters, according to the general weather situation. This phenomenon is very